



A.D. 1863, *17th August.* N° 2042.

S P E C I F I C A T I O N

OF

THOMAS LOFTUS.

SMOKE-CONSUMING APPARATUS.

L O N D O N :

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A.D. 1863, 17th AUGUST. N° 2042.

Smoke-consuming Apparatus.

LETTERS PATENT to Thomas Loftus, of Preston, in the County of Lancaster, Mechanical Engineer, for the Invention of "IMPROVEMENTS IN APPARATUS FOR ATTACHING TO STEAM BOILERS AND FLUES FOR THE CONSUMPTION OF SMOKE."

Sealed the 16th February 1864, and dated the 17th August 1863.

PROVISIONAL SPECIFICATION left by the said Thomas Loftus at the Office of the Commissioners of Patents, with his Petition, on the 17th August 1863.

I, THOMAS LOFTUS, of Preston, in the County of Lancaster, Mechanical
5 Engineer, do hereby declare the nature of the said Invention for "IMPROVE-
MENTS IN APPARATUS FOR ATTACHING TO STEAM BOILERS AND FLUES FOR THE
CONSUMPTION OF SMOKE," to be as follows:—

This Invention consists of a peculiar combination and arrangement of
apparatus for admitting atmospheric air to the flues of steam boiler and other
10 furnaces by means of a horizontal air door under the dead plate; also by an
air valve under the bridge at the further extremity of the furnace, the air
door and valve being worked by a lever and connecting rod, to which is
attached a combustion bar by means of which (together with an improved
perforated bevel bridge) the smoke is ignited at the furthest extremity of the
15 fire and there consumed. The lever and connecting rod are worked by a
knocking-off motion, to which is attached a self-acting adjusting balance, by

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means of which the admission of atmospheric air is regulated to a given time or period in which the smoke shall be wholly consumed. Attached to the outside of the framing of the furnace door is a quadrant in which works a stud, to which is attached the lever and connecting rod before mentioned, which open and close the air valves, and also move the combustion bar. To 5 this quadrant is also attached a pillar, bracket, or pedestal supporting the self-acting adjusting balance, which is attached to the lever working the air valves and combustion bar by a rod. This self-acting adjusting balance consists of a hollow metal box or case, in which is placed a sufficient quantity of shot to cause the balance to fall back gradually to its original position after the closing 10 of the furnace door. The whole apparatus is set in operation by the opening of the furnace door, to which is attached a projecting piece of metal of any convenient shape. On opening the furnace door the projecting piece of metal is brought into contact with the rod attached to the self-acting adjusting balance, causing the said balance to fall over, by which movement the lever 15 and connecting rod attached to the air valves and combustion bar is set in motion, the air valves are opened, and the combustion bar brought into action, causing the smoke to ignite and consuming it at once. On closing the furnace door the self-acting adjusting balance (regulated by shot which pass through a hinged grated door) gradually falls back to its original position after the smoke 20 is consumed.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said Thomas Loftus in the Great Seal Patent Office on the 16th February 1864.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, THOMAS 25 LOFTUS, of Preston, in the County of Lancaster, Mechanical Engineer, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Seventeenth day of August, in the year of our Lord One thousand eight hundred and sixty-three, in the twenty-seventh year of 30 Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Thomas Loftus, Her special license that I, the said Thomas Loftus, my executors, administrators, and assigns, or such others as I, the said Thomas Loftus, my executors, administrators, or assigns, should at any time agree with, and no others, from time to time and all times thereafter 35 during the term therein expressed, should and lawfully might make, use,

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exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN APPARATUS FOR ATTACHING TO STEAM BOILERS AND FLUES FOR THE CONSUMPTION OF SMOKE," upon the condition (amongst others) that I, the said Thomas
5 Loftus, my executors or administrators, by an instrument in writing under my hand and seal, or under the hand and seal of one of them, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and
10 immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Thomas Loftus, do hereby declare the nature of my said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement, reference being had to the accompanying Drawings, and to the
15 letters and figures marked thereon, that is to say:—

My said Invention consists of a peculiar combination and arrangement of apparatus for admitting atmospheric air to the flues of steam boiler and other furnaces by means of a horizontal air door under the dead plate, also by an
20 door and valve being worked by a horizontal lever (acted upon by a spring) and connecting rod, to which is attached a combustion bar, by means of which (together with an improved perforated bevel bridge) the smoke is ignited at the furthest extremity of the fire and there consumed. The horizontal lever and connecting rod are worked by a projecting piece of metal on the furnace
25 door, which pushes back the lever into a retaining catch or notch in a quadrant, herein-after referred to. This quadrant is attached to the outside of the framing of the furnace door, and on it works the lever above referred to, carrying a stud attached to the connecting rod before mentioned, which opens and closes the air valves, and also moves the combustion bar. To this quadrant
30 is also attached a bracket supporting a self-acting adjusting balance lever, which acts by an eccentric on the horizontal lever working the air valves and combustion bar so as to release such lever from its holding notch. This self-acting adjusting balance is worked by a chain attached to the furnace door, and consists of a hollow metal box or case, in which is placed a sufficient
35 quantity of shot to cause the balance to fall back gradually to its original position after the closing of the furnace door. The whole apparatus is set in operation by the opening of the furnace door when the balance lever is elevated. On the closing of the door this lever acts upon the horizontal lever and releases it, the air valves and combustion bar being then set in motion,

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the air valves being closed and the combustion bar brought into action, causing the smoke to ignite and become at once consumed.

And in order that my said Invention may be fully understood, I shall now proceed more particularly to describe the same, and for that purpose I shall refer to the several Figures on the Sheet of Drawings hereunto annexed, the same letters of reference indicating corresponding parts throughout all the Figures.

Fig. 1 of the Drawings represents a longitudinal vertical section of a steam boiler furnace fitted with my improvements, and applied to a central cylindrical flue steam boiler; Fig. 2 is a sectional plan of the same, taken above and below the fire-bars; and Fig. 3 is an end elevation of the boiler, shewing the fire-door and parts connected and operating therewith.

A is the boiler; B, the furnace; C, the dead plate; and D, the improved perforated bevel bridge. The front or inner part of the dead plate is perforated, as shewn at *a*, or a separate perforated plate or grating may be introduced at that part for the admission of air into the furnace from the ash-pit E. Immediately beneath the perforations *a* there is fitted a hinged door or air valve F, which regulates or controls the passage of the air through the perforations. G is a second air valve contained within a box or casing H situate at the farthest end of the ash-pit, its object being to regulate the supply of air to the back part of the bridge. Both these air valves are actuated by a rod I, which also serves to bring into position the combustion bar K, by throwing it forward over the bridge or backwards into the position shewn in red lines, such combustion bar being brought over the bridge when the air valves are closed and moved back, as shewn by the red lines when the air valves are opened. This combustion bar may, however, be used or dispensed with at pleasure, as the apparatus is complete without it. The bridge D is made of cast iron, it is bevelled downwards on its face towards the rear ends of the fire-bars, as shewn, and is perforated or made cellular so as to allow it to become readily heated to redness, the heat of the bridge and combustion bar greatly facilitating the combustion of the gases as they pass over and in contact with them. The rod I, which works the air valves, is connected by a long link or connecting rod L, which is jointed thereto to the horizontal lever M, which works on a fixed centre *b*, and traverses over the surface of a supporting quadrant or frame N secured to the framing of the fire-door O. At or near the centre of this quadrant there is formed a notch or recess, into which the lever M drops when it is brought into the position shewn by the red lines, and is there retained until it is released in the manner hereinafter described. Immediately beneath this notch or recess, and in a line

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therewith, is fitted a horizontal stud *c* carried by the quadrant, and upon this stud *c* works freely one end of a self-acting weighted lever *P*, this end of the lever having an eccentric formed thereon, as shewn at *d*, which eccentric should be so adjusted that when the lever *P* descends it will act against the under
5 side of the lever *M* and lifted out of its notch or recess, thereby releasing it and leaving it free to traverse along the quadrant to the position shewn in black lines in Figure 2, a spring *e* or other convenient mechanical contrivance being employed for moving the lever so soon as it is released from its notch. The lever *M* is brought into the notch by the act of opening the fire-door or
10 projection *f*; on the door coming in contact with the side of the lever *Q* is a chain, which is connected at one end to the free end of the weighted lever *P*, and at the opposite end to the fire-door, the chain being guided by passing over a swivel pulley block *g*, hung over the centre of the fire-door framing, as is clearly shewn in Fig. 3. The weighted lever carries a box or chamber *h*,
15 which is divided into two compartments by a hinged door, and contains small shot and mercury for the purpose of weighting the same. The action of the entire apparatus is as follows:—On opening the fire-door *O* the chain *Q* is drawn tight and elevates the free end of the weighted lever, bringing that lever into a nearly vertical position, whilst at the same time the lever *M* is
20 pushed back along the quadrant into the notch or recess. This movement of the lever *M* opens the two air valves and throws back the combustion bar, as shewn by the red lines, thus admitting air simultaneously at both ends of the furnace. On closing the furnace door, the weighted lever *P*, being no longer supported by the chain *Q*, begins to descend, the shot or mercury slowly
25 passing through the hinged door or grating, causing the lever to fall gradually. As the lever *P* descends the eccentric lever *M* out of its notch or recess, and this lever is then pushed forward along the quadrant by the spring or other contrivance for that purpose, the result being the closing again of the air valves.

Figure 4 represents a sectional view of a slightly modified arrangement of
30 the air valve under the dead plate, which will be sufficiently well understood from the Drawing without further description. Figures 5 and 6 represent respectively, on a larger scale, a longitudinal vertical section and sectional plan of the balance lever *P* and box *h*, showing the small shot and grating *i* under the box, and the mortice *d* on the end of the lever. In these views
35 the lever is shewn in its lowest position (the furnace door being then shut); but in Fig. 7 I have shewn it elevated nearly to a vertical position, such being the position it will assume when the furnace door is open.

Having now described and particularly ascertained the nature of my said Invention, and the manner in which the same is or may be used or carried

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into effect, I would observe in conclusion that what I consider to be novel and original, and therefore claim as the Invention secured to me by the herein-before in part recited Letters Patent, is,—

1st, the general construction, arrangement, and combination of machinery or apparatus to be attached to steam boiler or other furnaces, substantially in 5 the manner and for the purpose as herein-before described.

2nd, the application and use of the weighted or balance lever P, substantially in the manner and for the purpose herein-before described.

3rd, the application and use of the quadrant or frame N and lever M combined, substantially in the manner and for the purpose herein-before 10 described.

4th, the peculiar means of admitting and regulating the supply of air at the front and back of the furnace simultaneously, substantially as herein-before described.

5th, the application and use of a combustion bar, substantially in the manner 15 and for the purpose herein-before described.

6th, the mode of working the air valves and combustion bar, as herein-before described.

7th, the peculiar construction of fire bridge, as herein-before described.

In witness whereof, I, the said Thomas Loftus, have hereunto set my 20 hand and seal, this Fifteenth day of February, One thousand eight hundred and sixty-four.

THOMAS LOFTUS. (L.S.)

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FIG. 1.

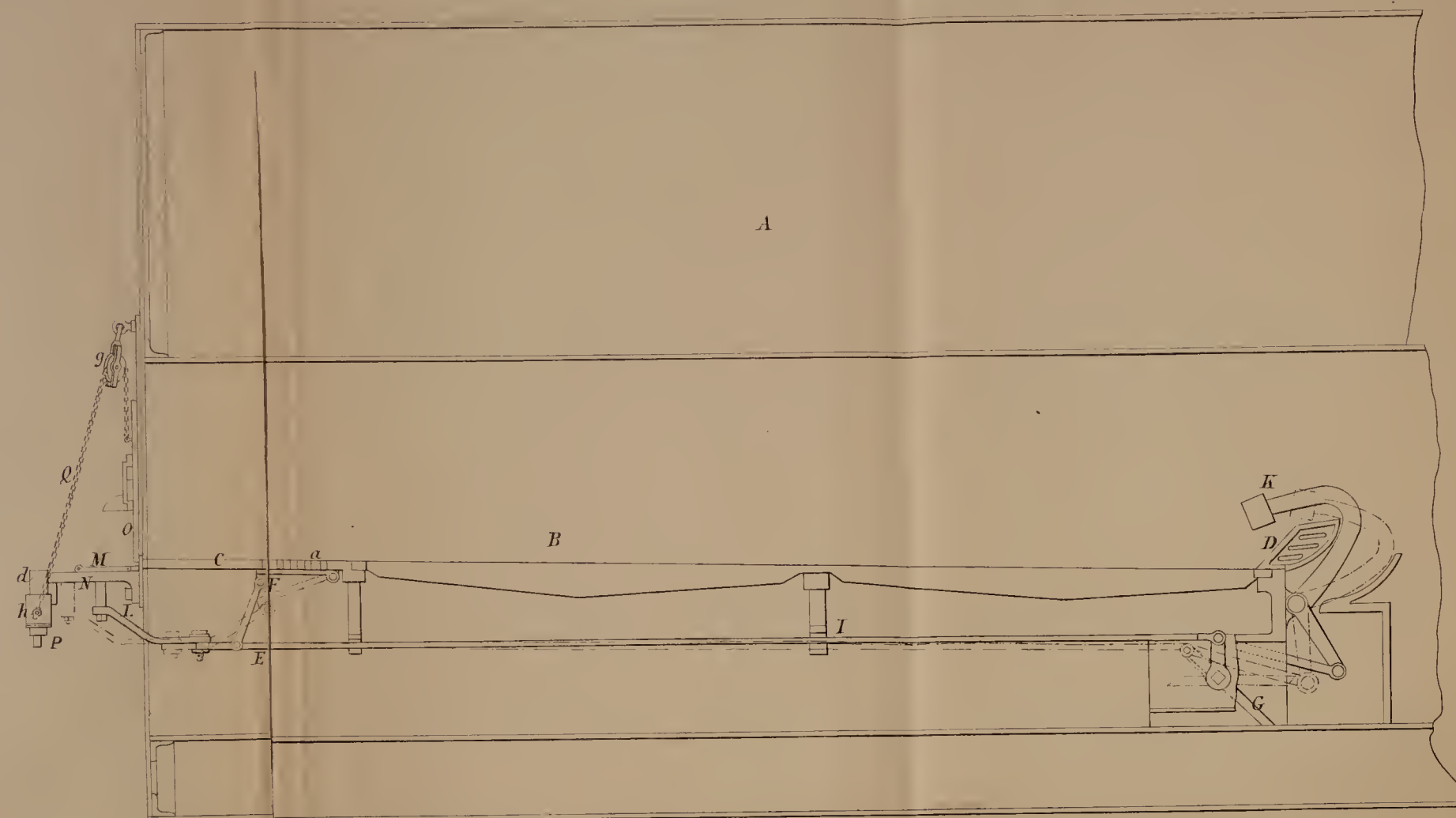


FIG. 2.

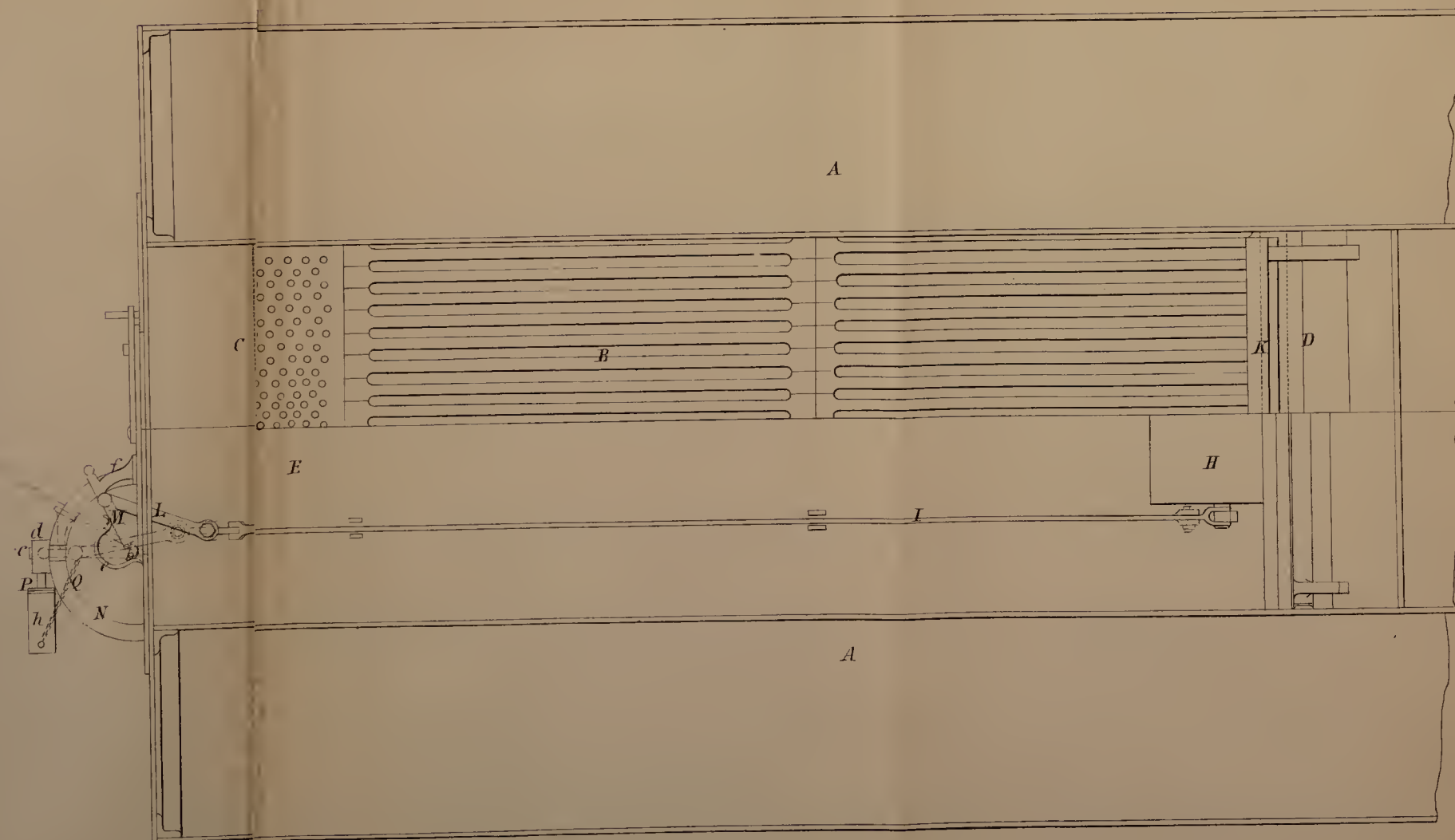


FIG. 3.

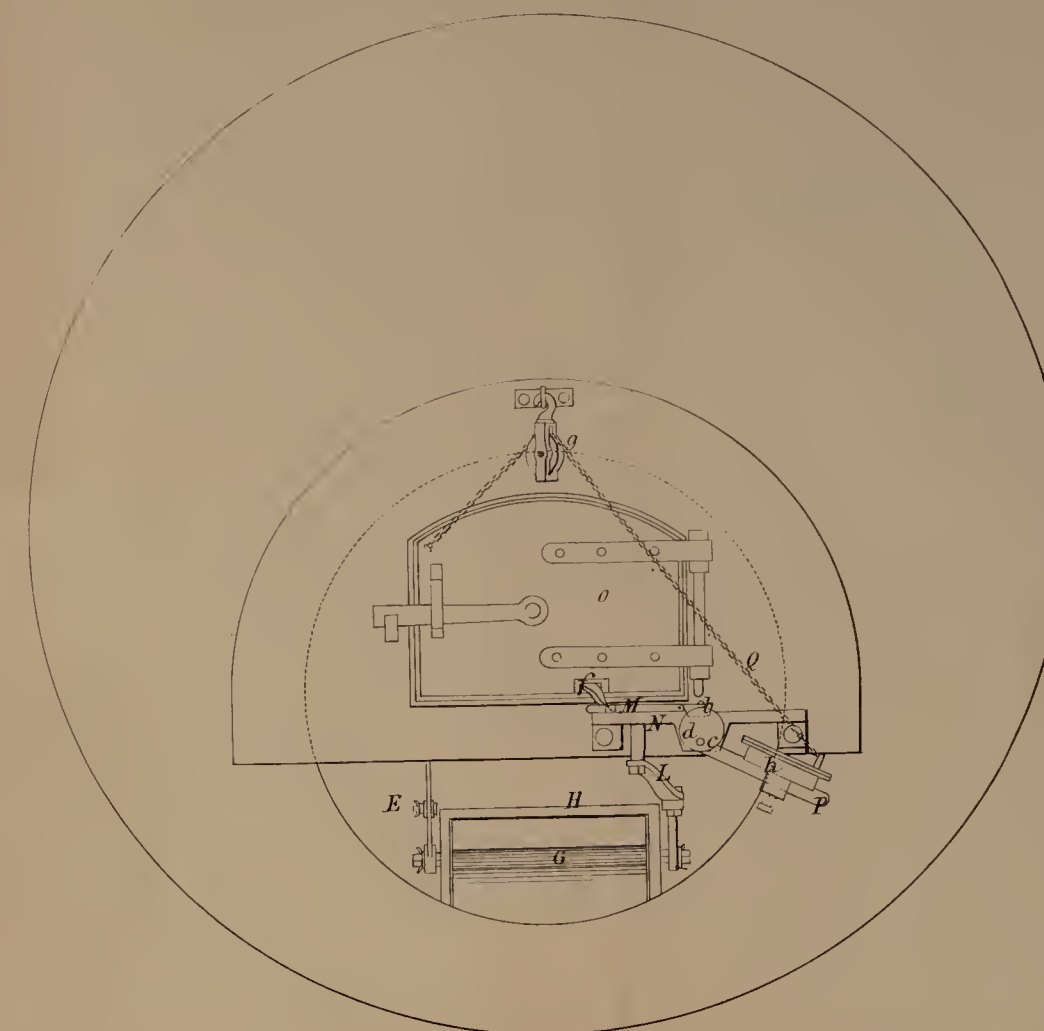


FIG. 4.

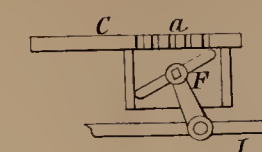


FIG. 5.

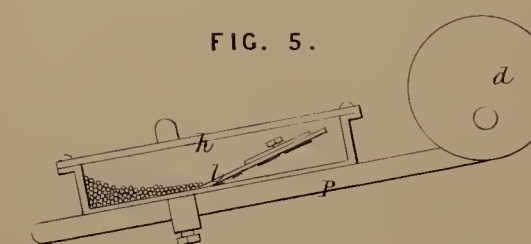


FIG. 6.



FIG. 7.

